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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/686,084	10/14/2003	Bruno Ghyselen	4717-11800	7276

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EXAMINER
PHAM, THANH V

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 11/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

A92

Office Action Summary	**Application No.** 10/686,084	**Applicant(s)** GHYSELEN ET AL.	
	Examiner Thanh V. Pham	**Art Unit** 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 09/16/2005 has been entered.

Response to Amendment

Drawings

2. The changes are not accepted by the examiner, the applicant is notified that the replacement sheet(s) should be labeled “Replacement Sheet” in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. The objection to the drawings is maintained and will not be held in abeyance.

Claim Rejections - 35 USC § 112

3. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. The terms "relatively thick" and "relatively thinner" in claim 1 are relative terms which render the claim indefinite. The terms "relatively thick" and "relatively thinner" are not defined by the claim, the specification does not provide a standard for ascertaining

the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. In this instance, the disclosure does not establish a range of thickness intended by the terms "relatively thick" and "relatively thinner" with respect to any thickness. ~~It is suggested that the terms "relatively" are deleted.~~ If the terms are intended to recite the thicknesses only with respect to each other no amendment is required.

Claim Rejections - 35 USC § 102

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claims 1, 3-10 and 12-16 are rejected under 35 U.S.C. 102(b) as being anticipated by Goesele et al. US 6,150,239.

Re claim 1, the Goesele et al. reference discloses a method for concurrently producing at least a pair of semiconductor structures that each includes at least one useful layer on a substrate comprising:

providing an initial structure that includes a useful layer having a front face on a support substrate, col. 3, line 60 – col. 4, line 55;

implanting atomic species into the useful layer to a controlled mean implantation depth to form a zone of weakness within the useful layer that defines first and second useful layers, col. 4, lines 56-65;

bonding a stiffening substrate to the front face of the initial structure, col. 5, lines 12-14; and

detaching the first useful layer from the second useful layer along the zone of weakness to obtain a pair of semiconductor structures with a first structure including the stiffening substrate and the first useful layer and a second structure including the support substrate and the second useful layer, col. 5, lines 15-34.

In its analyses, the Goesele et al. reference differentiates the upper portion and the lower portion of the first substrate wherein

> the lower portion of the first substrate remains and can be used to produce additional thin layers for subsequent transfer (col. 1, lines 22-24)
> one monocrystalline substrate can be used to fabricate many monocrystalline layers of the same area as the original substrate (col. 3, lines 25-28).
> The implantation conditions must be chosen in such a way that the maximum in the depth profile of the concentration of this element is close to the corresponding maximum in the concentration profile of the subsequently implanted hydrogen (col. 4, lines 40-44).

In other passages, the Goesele et al. reference discloses

> Thin, monocrystalline silicon layers on an oxidized silicon substrate, ,, and thin monocrystalline silicon carbide layers on a glass or on oxidized silicon substrate have been realized by wafer bonding ... (col. 2, lines 28-41)
> In the method of the present invention the first substrate, from which the Si layer is transferred, can be reused (col. 3, lines 6-7).
> This method allows the transfer of the thin layer ... Both substrates can be covered by one or more surface coating layers. The first substrate can either be a bulk monocrystalline material or a layered monocrystalline substrate structure, as, for example, one consisting of at least one epitaxial layer on a monocrystalline material or thin polycrystalline surface layers and amorphous surface layers or III-IV compound epitaxial layers on a crystalline substrate ... According to the present invention the transfer of the thin layer, ... the two substrate, after they have been bonded, do not suffer from any degradation (col. 4, lines 3-23).

The passage of col. 4, lines 3-23 in addition to the other passages on the repeating process would provide the "initial" structure *after, at least, the first round of the process,* that includes a *thick, transferred* useful layer having a front face bonded to a support substrate and having a thickness sufficient to transfer multiple useful layers (*re claims 3-5*) *being ready for going through the second round of the* process. The repeated steps (step 1 to step 5, cols. 4-5) of the Goesele et al. reference would provide a semiconductor-on-insulator structure including the support substrate and a *thinner, transferred* second useful layer, wherein the second useful layer is suitable for electronic, optoelectronic, or optic applications as claimed. *When the thickness is exhausted at the last round, e.g., the final support substrate would be obtained.*

Re claim 6, the structures are suitable for use in electronic, optoelectronic or optic applications, col.1, lines 26-27.

Re claims 7-10 the Goesele et al. reference further discloses the case of silicon-on-insulator material wherein "the second substrate consists of an oxidized silicon wafer in which the silicon wafer is covered by an amorphous oxide layer. In this case, the monocrystalline silicon layer is initially a part of the first substrate", col. 1, line 60 – col. 2, line 2.

Re claims 12-16, the Goesele et al. reference discloses many different materials for the support substrate, the stiffening substrate and the useful layer, col. 3, line 60 – col. 4, line 23.

Claim Rejections - 35 USC § 103

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

8. Claims 2, 11 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goesele et al. as applied to claims 1, 3-10 and 12-16 above, and further in view of Abe et al. EP 1 174 926 A1 (provided by applicant) and Joly et al. US Pub. 2002/0089016 A1.

Re claim 2, the Goesele et al. reference discloses substantially all of the invention includes implanting atomic species into the useful layer but does not state clearly that implantation is through the front face of the layer although this practice is commonly applied in the art.

The Abe et al. reference, [0004] clearly teaches the

> ion implantation process ... hydrogen gas ions or rare gas ions are implanted into one silicon wafer through an upper surface thereof to form a micro-bubble layer ... thereafter the ion implanted surface is put into close contact with the other wafer ... then heat treatment (separation heat treatment) is applied to the wafers in close contact to separate the one wafer in such a manner that the contact portion is partly left in a state of a thin film at the micro-bubble layer performing as a cleavage plane (a separation plane).

It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the implantation of Goesele et al. with the implantation through the front face as taught by Abe et al. because the method of Abe et al. would provide the implantation of Goesele et al. with an enclosed layer, a separation plane to be cleaved.

Re claim 11, the Goesele et al. reference discloses “the bonding may either be anodic bonding ... or the bonding can be by still other methods” but does not clearly state the bonding is achieved by molecular adhesion. However, Joly et al. points out that molecular adhesion is known at the time of the invention, [0004]. To apply the molecular adhesion to the wafer bonding would have been obvious to one of ordinary skill in the bonding art as the molecular adhesion would be selected in accordance with the wafer bonding as taught by Goesele et al. The use of molecular adhesion is well known to those skilled in the art as taught by Joly et al.

Re claim 17, the applicant's admitted prior art, BESOI, on page 1 of the instant application discloses molecular bonding a source substrate to a support substrate. It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the bonding method of the Goesele reference with the molecular bonding as taught by applicant's admitted prior art. The use of molecular bonding is well known to those skills in the art as admitted by the applicant.

Response to Arguments

9. Applicant's arguments filed 09/16//2005 have been fully considered but they are not persuasive.

10. Even though FIGS 1 and 2 do form part of the methods of the present invention, they are not novel. MPEP § 608.02(g).

11. Applicant points to Goesele 's col. 4, lines 6-12 and states that "none of these different structures relate to that which is used in the present invention, namely an initial substrate having a transferred layer on a support", "it is no way a final substrate", "Goesele does not mention the thickness of the layer on the first substrate after the transfer of the monocrystalline thin layer onto the second substrate. Nor does he disclose implanting atomic species into the transferred useful layer". The examiner does not agree. The response to these arguments is mentioned to in the above rejection of claim 1. Further, if a thick, transferred useful layer is the only difference to the known Smartcut® method, the instant invention is not patentable because, at least, the patent to Goesele teaches to repeat the processing steps in which the layer must be thick

enough to be transferred until the thickness is exhausted, the atomic species must be implanted into the useful layer which is to define first and second useful layers, and part of the layer which is transferred -the second useful layer- must be thinner; when the thickness is exhausted, the final substrate would be obtained. Furthermore, the second round structure of the Goesele reference which can be compared to the initial structure of the instant application, starting from the aftermath of the prior art as in figs. 1 and 2. The two structures are the same as each other and that would provide "an initial structure, which after a layer thereof is detached, results in a complex structure that includes a useful layer remaining on the support substrate". If the second round is also the final round, the final support substrate and a thinner, transferred second useful layer would be obtained. The same method applies on the same "initial" structure would yield the same complex structure. What remains the same is the material, the useful layer, but thinner.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh V. Pham whose telephone number is 571-272-1866. The examiner can normally be reached on M-T (6:30-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TMP
11/01/2005

George Fourson
Primary Examiner